The Canadian Occupational Projection System

Quebec Region

(AUSSI DISPONIBLE EN FRANCAIS SUR DEMANDE)

PROFILE NO. 10

INDUSTRIAL AND OCCUPATIONAL PROFILE

OF THE QUEBEC FABRICATED METAL PRODUCTS SECTOR

Prepared as part of the

CANADIAN OCCUPATIONAL PROJECTION SYSTEM

(COPS)

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In this document, the masculine generally refers to persons of both sexes. In certain cases, however, reference is speciafically made to one sex.

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INTRODUCTION

This study is the eighth in a series of industrial and occupational profiles prepared as part of the Canadian Occupational Projection System (COPS). COPS is a qualitative and quantitative data base on occupational trends in the Canadian job market; the aim of the system is to identify potential imbalances in labour supply and demand that may arise sometime in the next five to seven years. It is therefore essentially a planning tool to be used by the main players in the labour market, in both the public and private sectors.

Making COPS an efficient planning tool requires a sustained effort to increase our knowledge about the main factors determining occupational demand in the various sectors of the economy. This was the objective that we set ourselves upon undertaking this survey of the Quebec fabricated metal products sector.

We centred our study on two sets of factors that, in our opinion, are predominant in determining change in occupational demand. First, the cyclical factors that more or less determine the level of business activity in terms of production value; these factors have a direct impact on the overall level of labour demand. Second, the structural factors that determine the occupational distribution required to carry out the different activities in the sector. We have focused on three of these structural factors: technological changes, technical changes and organizational changes.

Of course, these two sets of factors do not evolve independently of each other. Thus, changes in output very much depend on the capacity of firms in the sector to meet market demand. Furthermore, the second set of factors directly and indirectly affect the general employment level in the sector because they determine overall productivity to a large degree and thus the sector's ability to compete.

Whereas the first chapter gives a broad outline of the Quebec fabricated metal products sector, the second seeks to identify the chief cyclical trends in the industry. A brief look is also taken at changes in the sector's main markets over the last few years and the trends forecast for the period to 1992. Chapter 3 describes the various structural changes that have taken place in the sector, takes stock of the current situation and points to the structural trends that the sector should follow over the course of the projection period.

The last two chapters focus on specific occupations. We have attempted to measure the impact on the main occupational groups of the major factors determining change in the sector. To achieve this, we associated statistics on employment changes in the occupational groups between 1971 and 1981 with the identified cyclical and structural factors. We were thus able to forecast future trends given our expectations about these two sets of factors to the year 1992.

Owing to the lack of information about recent developments in the sector and out of a desire to give the main players in the industry an opportunity to voice their concerns, we consulted various players in the private sector as a preliminary step to our final analysis. Hence, a number of our conclusions about changes in occupational demand have been influenced by the replies we received to our industry questionnaire. The author nevertheless takes full responsibility for any errors that this report may contain.

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1- CHARACTERISTICS OF THE SECTOR

1.1 DEFINITION OF THE SECTOR

For the purposes of this study, the definition of the fabricated metal products sector is based on that given in Statistics Canada's Standard Industrial Classification (1970), that is, all industries whose main activity is the fabrication of metal products except machinery and electrical and transportation equipment. Statistics Canada identifies the following nine industry groups:

301 - Power Boiler and Heat Exchanger Industry
302 - Fabricated Structural Metal Products Industries
303 - Ornamental and Architectural Metal Products Industries
304 - Stamped, Pressed and Coated Metal Products Industries
305 - Wire and Wire Products Industries
306 - Hardware, Tool and Cutlery Industries
307 - Heating Equipment Industry
308 - Machine Shop Industry
309 - Other Metal Fabricating Industries

It should be noted that in 1980 Statistics Canada revised the industrial classification, thus modifying the definition of many industry groups. The slight changes that were made to the definitions of the metal products industries, for instance, broke up the existing series of historical data. Since no statistics prior to 1982 were available for the new industrial classification, we decided to use the old, 1970 classification.

1.2 SIZE OF THE SECTOR

The proximity of industrial markets in Quebec and Ontario has been a significant factor in determining the location of metal products manufacturing firms in these two provinces, which account for over 80% of Canadian shipments of metal products. With shipments worth $2.8 billion in 1983, approximately 25% of the Canadian total, the Quebec industry is second only to the Ontario industry.

Within the Quebec manufacturing sector, the fabricated metal products industry ranked eighth in 1983 in terms of shipments and seventh in terms of value added. The same year, industry employers paid out close to $657 million in salaries and wages to some 30,000 employees. Industry capital outlays amounted to around $56.5 million for machinery and equipment and $9.1 million for plant construction.

1.3 STRUCTURE OF THE SECTOR

The Quebec fabricated metal products sector is structured in much the same way as the overall Canadian sector. With 37% of shipments

of own manufacture, the stamped, pressed and coated metal products industries (304) form by far the largest single industry group in the sector. Next, and more or less on a par, come the fabricated structural metal products industries, with 11% of shipments, ornamental and architectural metal products industries, with 10%, and wire and wire products industries, with 14%.

The predominance of the stamped metal products subsector is partly due to the high value of shipments from the other stamped and pressed metal products industries group, which includes the production of coins. Since 1979 the Hull branch of the Royal Canadian Mint has been striking prestige gold coins. It is this production that accounts for the very swift growth in the value of subsector shipments since the late 1970s. The subsector is also important in terms of value added, where it ranks first with close to 24% of the sector total.

As far as its physical organization is concerned, the Quebec metal products sector is characterized by a large number of small firms. According to the most recent survey of CEIC employer files for Quebec,* nearly 80% of the province's firms had fewer than 20 employees while over 96% had fewer than 100. At the same time, just 3.3% of firms employed close to 40% of the sector work force.

Since for most metal products subsectors the proximity of industrial markets constitutes the most important factor in deciding where to locate, more urbanized areas offer the best advantages. Thus, the greater Montreal area** is home to more than 65% of sector firms, whereas the St Maurice Valley-Bois Francs-Eastern Townships and Quebec City-Saguenay-Lake St John regions together account for approximately 25% of employers in the sector.

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* Employer files, Quebec, 1985-1986, CEIC, Economic Services Branch, Quebec Region, November 1985.

** Comprises Metropolitan Montreal, South of Montreal and North of Montreal

2- ECONOMIC TRENDS IN THE SECTOR

2.1 MAIN MARKETS

With scarcely 8% of the total value of its shipments of own manufacture being exported, the Canadian fabricated metal products sector is geared above all to satisfying domestic demand. At the same time, Canadian manufacturers in the sector do not have to face strong foreign competition since only 15% of domestic demand was met by imports.

Despite the generally limited extent of international trade relative to the volume of sector shipments, certain subsectors, such as wire and wire products (305), hardware, tool and cutlery (306), heating equipment (307) and other metal fabricating industries (309), show more import-export activity than do others. In each of the above subsectors, Canadian industry is certainly more sensitive to foreign markets, but imports hold a larger share of the apparent Canadian market.

The very great range of metal products is an illustration of the market diversity faced by manufacturers. Yet, broadly speaking, it can be said that the bulk of market demand is for intermediate products in the secondary sector (manufacturing and construction) and, to a lesser degree, the mining sector.

In general, then, market demand for fabricated metal products is quite sensitive to the overall economic trends affecting the secondary sector. According to the nature of its products, however, each of the subsectors is oriented toward specific markets. Table 2.1, at the end of this chapter, provides an overview of the main characteristics of the markets for each subsector.

2.2 RECENT TRENDS AND FUTURE PROSPECTS

Driven by annual growth in manufacturing and construction of 4.3% in real terms between 1972 and 1976, the apparent Canadian market for fabricated metal products enjoyed strong growth of the order of 4.5% annually over the same period. The downturn in manufacturing and construction that followed, from 1977 to 1981, resulted in slower annual growth of 1.8% for the metal products sector. The 1981-1982 recession, in which construction investment dropped sharply, strongly depressed the Canadian market for metal oducts, which fell by 31.4% between 1981 and 1983.

Although the recovery in manufacturing allowed metal products manufacturers to see renewed growth in their shipments to these customers beginning in 1984, the sluggishness of construction investment in Canada persisted, so that by the end of 1985 demand had still not returned to 1981 levels. Thus, in 1985, Canadian shipments were still about 8% below their 1981 level measured in constant dollars.

While trends in Quebec shipments are strongly influenced by general trends in Canadian market demand, local market conditions also affect demand for local products. Differing cycles in construction activity in Quebec and Canada explain much of the divergence in industry performance. This was true of the last few years, for instance, when swifter recovery in Quebec construction investment allowed the province's metal products sector to regain virtually all the ground it lost during the last recession.

On the basis of forecast manufacturing growth of approximately 3.2% in Canada and 2.9% in Quebec and forecast increases in construction investment of 2.7% in Canada and 3.3% in Quebec, we anticipate the apparent Canadian market to grow at an average annual rate of 3.4% to 1992. At this rate of growth, the sector should reach its record 1980 output level by the end of the decade and climb to 10% above that level by 1992.

In Quebec, shipments of metal products, which over the last three years have benefited from slightly faster growth in construction investment than in Canada as a whole, should see somewhat slower growth than the apparent Canadian market to 1992, ie about 3.1% annually.

2.2.1 Power Boiler and Heat Exchanger Industry

The power boiler and heat exchanger industry saw its shipments fall by close to 45% when oil prices plummeted in 1983, causing a sharp drop in investment in the energy sector, the main market for this type of equipment.

Although large investments made by pulp and paper manufacturers, to improve their energy-related equipment, and firms in other key sectors such as aluminum, offset somewhat the negative effects of lower energy-sector investment, the permanent losses suffered in the petroleum and chemical products sectors may well jeopardize the chances of a full recovery in the industry over the long term.

Thus, in spite of a growing apparent Canadian market to 1992 and greater possibilities for penetration of the US market,* we anticipate that the Quebec power boiler and heat exchanger industry will enjoy only slow growth of the order of 0.8% to 1992.

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* The lack of waste disposal sites in the United States is expected to result in extensive investment in waste elimination plants.

2.2.2 Fabricated Structural Metal Products Industries

The fabricated structural metal products industries have seen their main market shrink considerably as structural concrete is used more and more in commercial and institutional construction. Now virtually confined to the industrial construction sector, manufacturers of steel structures for buildings have not only been pushed out of a market showing stronger growth but have been directly affected by the sharp cyclical swings in manufacturing sector capital investment.

In addition to the market for steel structures for buildings, Quebec firms have benefited in recent years from large investments in the construction and improvement of the electrical power distribution grid (which requires steel pylons). Furthermore, Quebec's greater share, relative to the other provinces, of the production of pre-engineered metal buildings, a market that is expanding more swiftly than that for structural metal products, goes a long way to explaining the better performance of Quebec shipments in this industry subsector.

Over the next few years the recovery in Canadian manufacturing sector investments in plant construction should mean that the subsector's potential market will enjoy strong growth of 3.4% annually to 1992. However, since in Quebec part of this recovery has already occurred over the last two years, the province's shipments should grow at only half this rate, or 1.9%.

2.2.3 Ornamental and Architectural Metal Products Industries

In contrast to the structural metal products industries, the ornamental and architectural metal products industries, which also depend to a large degree on the construction sector, have seen their market increase notably since 1971, despite the slowdown that occurred from 1977 to 1981. With over 75% of their production capacity concentrated in the manufacture of doors and windows for residential and commercial use, these industries have greatly benefited from the increased penetration of metal products at the expense of wood products. Moreover, in recent years, demand in the new construction sector has been boosted by strong growth in the renovation sector.

Since 1983, Quebec firms in these industries have enjoyed the benefits of greatly increased activity in the residential construction sector, partly owing to the establishment of various housing development programs. Over the next few years this trend should continue, with growth in both residential and non-residential construction investment remaining high.

2.2.4 Stamped, Pressed and Coated Metal Products Industries

The very strong growth in Quebec shipments of stamped and pressed metal products (304) beginning in the late 1970s can in large

part be explained by the launching of the Canadian prestige gold coin program at the Hull branch of the Royal Canadian Mint. However, as early as 1981 these gains were cut dramatically by the drop in disposable income that occured during the last recession.

This subsector's output in Quebec is also characterized by two other types of products, which have very different markets. Accounting for approximately 25% of total production, metal containers of all kinds are manufactured chiefly to satisfy demand in the food and beverage market. Although this outlet offers little potential for expansion because of stagnating population growth, the increasing popularity of foods that have undergone greater processing is opening up a swiftly expanding market for the required packaging products. At the same time, however, the marketing of new containers that are more practical ecologically, particularly waxed paper containers, together with increased deep freezing has worked against the penetration of cans into these new markets. It appears that only the beverage market, which has recently become easier to penetrate because of the introduction of a new recyclable can, has really constituted an expanding market segment over the last few years.

The subsector's other chief product group, siding and other architectural stamped products, experienced similar market conditions to those, described earlier, for ornamental and architectural metal products.

While, over the next few years, the growth potential in the food can market should remain fairly limited, the siding and architectural products market should continue to grow. Recovery in the stamped metal products industries therefore depends very much on the success of the Canadian prestige gold coin program. Overall, we forecast an increase in Quebec production of 3.8%, ie a rate of growth slightly above that of the apparent Canadian market.

2.2.5 Wire and Wire Products Industries

Chiefly producing steel wire and cable as well as all kinds of nuts, bolts and screws, the wire and wire products industries depend on markets that are strongly linked to manufacturing and, to a lesser degree, construction. While this subsector saw fairly steady growth during the 1970s, it has had to contend with serious problems since 1980, as have other industries that are involved in the production of steel products.

In addition to the worldwide slowdown in manufacturing, the shift in modern industry from steel to substitute materials is certainly having an effect on demand for both industrial fastners and wire. Thus, although a certain amount of lost ground should be regained over the next few years, these industries should see slower growth during the 1980s than the manufacturing sector as a whole.

We anticipate annual growth in the apparent Canadian market of 2.6% over the projection period. Quebec shipments should grow at an annual rate of 3.0%, reflecting slightly swifter growth in exports through to 1992.

2.2.6 Heating Equipment Industry

Though operating in an expanding market until 1982, the heating equipment industry (307) saw its shipments decrease substantially during the 1970s and early 1980s. Fierce competition from US manufacturers and certain productivity problems encountered by local firms are the two main factors explaining this loss of market share. In addition, major changes in the nature of heating products, and particularly the switch from oil to electricity, increasing the demand for electrical baseboard heaters, have deprived these producers of a significant share of the replacement market, ie the most active market over the last few years.

Over the projection period the volume of residential construction should remain relatively high, thus allowing the apparent market to grow by 3.6% annually to 1992. Adjustments in the type of products offered by Quebec firms, in particular a broader range of ventilation systems, together with general market growth should result in a 1% annual increase in Quebec shipments in this subsector.

2.2.7 Hardware, Tool and Cutlery Industries and Other Metal fabricating Industries

Recent trends in the hardware, tool and cutlery subsector (306) and the other metal fabricating subsector (309) point to the fact that the markets for these industries depend very much on manufacturing activity.

These industries are some of the most sensitive to swings in manufacturing output, and thus their markets should benefit fairly soon from the expected recovery in this area. Quebec firms, like their counterparts in the rest of Canada, should be able to maintain their share of the domestic market.

2.2.8 Machine Shop Industry

The machine shop subsector, which is chiefly engaged in custom and repair work, is also very dependent on the health of its manufacturing market. The industry did run into some serious difficulties, however, between 1971 and 1974 as Canadian shipments dropped over 20% in real terms. A major part of this drop was suffered by finished products manufactured by firms that, because of their specialization, have since been reclassified in other industrial sectors, such as machinery and transportation equipment. The activity of custom and repair work rose by almost 10% over this period.

In contrast to the situation elsewhere in Canada, in Quebec the industry's fall in shipments of own manufacture does not seem to have been offset by a comparable rise in repair work. Despite the return to growth in 1978, shipments remained below their 1971 level.

Like the sector as a whole, the machine shop industry should benefit from the anticipated recovery in manufacturing over the projection period and consequently enjoy annual growth in shipments of the order of 1.3% in Quebec.

TABLE 2.1
CHIEF PRODUCTS AND MAIN MARKETS
FABRICATED METAL PRODUCTS SECTOR

SUBSECTOR	CHIEF PRODUCTS	MAIN MARKETS
301- Power boiler	Power boilers Pressurized tanks Sheet metal	Export: 20.3% Industrial construction Manufacturing: oil and coal
302- Structural metal	Buildings Transmission pylons Wrought steel plates Bridges	Export: 2.2% Industrial construction
303- Ornamental and architectural	Windows Doors Portable buildings	Export: 6.9% Residential construction Institutional and commercial construction Industrial construction
304- Stamped, pressed coated metal products	Stamped metal parts Metal cans for food Other metal containers	Export: 3.6% Final consumption Manufacturing: food, beverage, other
305- Wire products	Steel wire, cable Nails, screws, bolts	Export: 15.1% All kinds of construction Manufacturing: all

TABLE 2.1 (cont'd)
CHIEF PRODUCTS AND MAIN MARKETS
FABRICATED METAL PRODUCTS SECTOR

SUBSECTOR	CHIEF PRODUCTS	MAIN MARKETS
306- Hardware, tool, cutlery	Dies and moulds Hand tools Hardware	Export: 14.6% Manufacturing: metla products, machinery, transport equipment lumber, etc.
307- Heating equipment	Heating equipment	Export: 16.1% Construction: all kinds
308- Machine shop	Fixed-rate repairs	Export: - Manufacturing: all
309- Other metal products	Miscellaneous	Export: 16.9% Manufacturing: all

TABLE 2.2
TRENDS IN MAIN MARKET AND PRODUCTION INDICATORS
FOR THE FABRICATED METAL PRODUCTS SECTOR
1971-1985
AND PROSPECTS TO 1992

	1971 INDEX = 100				AVERAGE ANNUAL RATES			
	1976	1981	1985	1992	1972-76	1977-81	1982-85	1986-92
Manufacturing GDP								
Canada	123.5	137.0	145.0	180.7	4.3	2.1	1.4	3.2
Québec	115.4	130.9	130.1	159.4	2.9	2.5	-0.1	2.9
Construction (investment)								
Canada	123.6	139.1	132.6	159.8	4.3	2.4	-1.2	2.7
Québec	133.5	113.1	125.8	157.9	6.0	-3.3	2.7	3.3
Construction (residential)								
Canada	135.6	114.8	125.9	159.1	6.3	-3.3	2.3	3.4
Québec	145.9	106.8	160.3	203.9	7.8	-6.0	10.7	3.5
Construction (non-residential)								
Canada	118.1	150.3	135.7	161.3	3.4	4.9	-2.5	2.5
Québec	133.4	121.3	118.6	147.9	5.9	-1.9	-2.4	3.2

(*) Based on the Informetrica model: post-workshop, first quarter, 1986.

SOURCE: Statistics Canada, CANSIM

TABLE 2.3
RECENT AND PROJECTED TRENDS IN THE APPARENT
CANADIAN MARKET FOR FABRICATED METAL PRODUCTS
1971-1992

		1971 INDEX = 100				AVERAGE ANNUAL RATES			
		1976	1981	1985	1992	1972-76	1977-81	1982-85	1986-92
301-	Power boiler	159.0	119.3	80.0	97.5	9.7	-5.6	-9.5	2.9
302-	Structural metal	114.1	119.0	117.5	148.2	2.7	0.8	-0.3	3.4
303-	Ornamental and architectural	136.7	142.1	128.1	173.1	6.5	0.8	-2.5	4.4
304-	Stamped, pressed coated	130.4	155.9	135.7	171.4	5.4	3.6	-3.4	3.4
305-	Wire products	109.7	129.8	121.9	146.1	1.9	3.3	-1.4	2.6
306-	Hardware, tools, cutlery	136.4	138.9	131.4	174.5	6.4	0.4	-1.2	4.0
307-	Heating equipment	113.0	138.1	118.0	150.7	2.5	3.6	-3.3	3.6
308-	Machine shop	84.5	117.2	108.8	118.0	-3.3	6.8	-3.8	1.2
309-	Other metal products	129.4	132.5	126.6	167.4	5.3	0.5	-1.1	4.1
301-309	Sector total	124.9	136.3	123.4	157.4	4.5	1.8	-2.3	3.5

SOURCES: Statistics Canada, Manufacturing industries, Cat No 31-203
Statistics Canada, Exports by commodities, Cat No 65-004
Statistics Canada, Imports by commodities, Cat No 65-007
CEIC, Economic Services Branch, Quebec Region

TABLE 2.4
RECENT AND PROJECTED TRENDS IN QUEBEC
OUTPUT OF FABRICATED METAL PRODUCTS
1971-1992

		INDICE 1971 = 100				AVERAGE ANNUAL RATES			
		1976	1981	1985	1992	1972-76	1977-81	1982-85	1986-92
301-	Power boiler	137.0	81.4	72.2	76.1	9.6	-9.9	-3.7	0.8
302-	Structural metal	144.3	154.5	165.9	189.1	8.5	1.4	1.8	1.9
303-	Ornamental and architectural	165.1	151.2	160.3	211.0	8.3	-1.7	1.5	4.0
304-	Stamped, pressed and coated	111.5	235.7	231.6	300.9	2.8	16.1	-0.4	3.8
305-	Wire products	115.0	138.2	136.1	167.4	2.2	3.8	-0.5	3.0
306-	Hardware, tools, cutlery	142.3	133.2	127.9	170.2	6.1	-1.3	-1.0	4.2
307-	Heating equipment	70.2	67.5	66.1	71.0	-9.4	-0.8	-0.5	1.0
308-	Machine shop	66.7	82.5	77.3	84.6	-6.7	4.3	-1.6	1.3
309-	Other metal products	169.7	164.3	166.2	218.9	11.2	-0.6	0.1	3.1
301-309	Sector total	124.4	153.5	152.8	189.8	3.9	4.5	-0.1	3.1

SOURCES: Statistics Canada, Manufacturing industries, Cat No 31-203
CEIC, Economic Services Branch, Quebec Region

3- TECHNOLOGICAL, TECHNICAL AND ORGANIZATIONAL TRENDS

3.1 TECHNOLOGICAL CHANGES

The availability of new data processing and other electronic technology may have far-reaching effects on the sector over the next few years. Computer-aided design and manufacturing, automation and robotics, were they brought in on a large scale, would have a major impact on activities such as design, manufacturing, assembly and handling. New office automation technology may bring dramatic changes to important activities affecting management, planning, and inventory, cost and production control.

But the fact that this technology is available does not automatically mean that it will be accepted and used. Beforehand, criteria such as the practical applicability of the technology to the type of production and the accessibility of the technology in terms of cost and skills must be met. Moreover, acquisition of new technology depends to a large extent on the reasons why companies feel they need this technology: incentives such as the prospect of increasing market share, cutting costs or maintaining market share against fierce competition.

3.1.1 Data Processing Technology

Recent advances in microcomputers have made data processing technology much more accessible to sector firms in terms of cost (as prices have come down) and skills (as more user-friendly software has become available). This progress has meant that acquisition of the technology has been very rapid over the last few years.

The main incentive for companies to introduce data processing technology seems to be cost control. Thus, accounting duties are the first to be computerised. The vast majority of employers we consulted said that the main focus in this regard is not bookkeeping and the preparation of financial statements but the development of a detailed cost accounting system to allow more effective cost control. In addition to this comprehensive system, most of the companies we consulted also had a fairly sophisticated inventory management system (for raw materials, parts and finished products), it too designed not only to avoid stock shortages but also to reduce the increasingly higher costs of stock financing.

Cost accounting and inventory control are the two main uses of data processing common to all firms in the sector that have invested in computer technology. The two components also form the basis of these companies' management information system, the second area of activity that has been significantly affected by the introduction of EDP technology.

In recent years a number of sector firms have set up electronic filing systems for information about customers, suppliers, employees, sales, products, etc. When used in conjunction with the data provided by the cost accounting system, this information constitutes a management tool that is increasingly being applied in areas such as personnel management, production planning and the drawing up of a company's long-term strategies.

The development of microcomputers has not only made data processing technology available to smaller businesses but has also enabled more decentralized decision-making in larger companies. With the development of more flexible systems geared specifically to meet the needs of users (direct access), available information can be accessed on a continuous rather than just a periodic basis.

While the development of management information systems has been completed to varying degrees in sector firms, the use of computer technology in product design is still largely on the drawing board. In this area, both as regards microcomputer and computer-aided design technology, most industry employers said that they did not have any investment plans for the next few years. This situation can in part be explained by the fact that many sector companies do very little product design work (often limited to designing machines and tools for use within the firm).

Respondents to our industry questionnaire also indicated that the penetration of word processing technology in the sector has been very low. The limited volume of typing required by these firms considerably reduces the advantages of this new technology over the conventional typewriter. Thus, the recent trend in the sector should continue over the projection period. While cost accounting systems are used quite extensively in sector firms, future investments will in all likelihood be aimed at the improvement of inventory control systems and the establishment of more comprehensive management information systems.

3.1.2 Production Technology

Over the last few years, production-related technology has not been adopted as swiftly and as extensively as data processing technology. The high cost of this technology and the limits imposed by small-scale production constitute major obstacles to its introduction in virtually all sector industries.

Hence, it is industries with larger-scale production that in recent years have made substantial investments in the areas of automated production processes and numerically controlled equipment. These industries are the wire and wire products industries, the stamped, pressed and coated metal products industries, and to a lesser degree the ornamental and architectural metal products industries.

Packaging is one area where technology has been introduced extensively, chiefly because the available packaging technology is quite accessible for most sector industries. Packaging (ie counting and packing the parts and sealing the container) consists of tedious manual tasks that can easily be automated with appreciable savings in terms of time and labour. In addition, certain technologies facilitating the palletization of products such as food cans or the packaging of larger products such as heating equipment and doors and windows have been introduced successfully in certain sector firms. While current estimates put the overall level of automation of these operations at only 25%, the respondents to our industry questionnaire indicated that this proportion could reach 50% by 1992.

As for actual manufacturing operations, the possibilities for significant technological changes vary greatly from one industry to another. Generally speaking, however, sector industries are limited by small-scale production. Nevertheless, two types of changes in particular are being considered in this area.

First, a major effort is being made to render production processes more continuous through elimination of many stages. It should be noted that because of their specialized output a large proportion of sector firms use machinery that they have designed themselves. Thus, while some companies are investing in more complex machinery integrating several operations, moves to automate in other firms usually take the form of more effective linking of various machines in order to eliminate unnecessary handling.

Besides endeavouring to eliminate stages of production, sector firms are also adding programmable microprocessors to mass production machinery. This is the second type of widespread technological advance in manufacturing. In this case, preprogrammed numerical control units are installed on machinery that is already in use. This new technology not only speeds up the production process but also shifts labour input from actual machinery operation to production monitoring.

Metal cutting, shaping, stamping, pressing and coating operations are those that are the most likely to be affected by these kinds of technical and technological changes, wherever the scale of production makes it worthwhile. The most significant developments in these areas should occur in the hardware, stamped metal products, wire products, and ornamental and architectural products industries.

In spite of the increasing use of numerically controlled machine tools (NCMTs), machining operations should not undergo any major changes over the next few years. This is because the advantage of NCMTs makes a significant difference only in medium- or large-scale production, or small-scale production of parts requiring complex machining. With the exception of the machine shop industry and certain tool and other metal fabricating industries, the machining operations of sector firms are

chiefly oriented toward machinery and equipment maintenance, meaning that they concentrate on the fabrication of single parts or on very small production runs.

Similarly, close to 55% of the volume of activity in the Quebec machine shop industry consist of maintenance or repair work for manufacturing companies. Here again, most work involves very limited production runs and is often done on the basis of existing parts (without any detailed blueprints). NCMTs therefore do not constitute an advantage for this type of output.

Machine shops that concentrate on custom work or mass production, companies manufacturing specialized tools such as dies and moulds, and certain other metal fabricating firms are the most likely to profit from investment in NCMTs. The main technological developments in this area should therefore take place in these companies. A respondent to our industry questionnaire said that from approximately 30% in 1984 the volume of work done by NCMTs in these companies could climb as high as 75 to 80% by 1992. According to the most recent survey of NCMTs, conducted by the monthly magazine Canadian Machinery and Metalworking, 59 companies (38 machine shops, 12 tool manufacturers and 9 other metal products manufacturers) in the sector were using a total of 191 numerically controlled machine tools. If we combine these figures with the forecast made by the respondent to our industry questionnaire, we arrive at an estimated 350 to 400 NCMTs that will be in operation in these companies by 1992.

Assembling and finishing operations are generally more labour intensive than actual manufacturing operations. Of all the industries in the sector, only the food can industry has been able to automate these operations on a large scale. Although the technology is already available, the respondents to our industry questionnaire declared that it was unlikely that major investments would be made in this area over the next few years. Here again, the small scale of production in most companies makes this kind of investment impossible. Some improvements may be made, however, by combining the duties of certain workers.

3.2 TECHNICAL AND ORGANIZATIONAL CHANGES

Technological changes are not the only factors that have a significant impact on general trends in the sector and on sector employment. During the 1970s and 1980s a number of other changes in work organization and production techniques had a noticeable effect on the job situation in certain occupational groups.

Thus, the gradual shift from riveting to welding over the last ten years has strongly affected employment in the assembling and welding occupations. Furthermore, the use of plastics for certain parts in the heating equipment industry and of aluminum for parts in the

soft-drink can industry are two technical developments that have changed the traditional face of these industries.

Over the next few years there should be a growing trend in the sector toward more decentralized decision-making. Now that companies dispose of more effective management tools, they are determined to reduce costs by eliminating intermediate levels of responsibility. Production units will be the big winners in this reorganization, with both workers and production managers being given greater responsibility. In addition to its impact on management duties, this reorganization should also bring about increased integration at other levels, with the same workers being made responsible for both production and quality control.

As mentioned in the previous section, the introduction of continuous production processes is an important technical change that will considerably affect sector employment. Thus, handling activities should not increase to the same extent as other activities in the sector, and employment in handling feel the effect of this change.

While administrative and handling activities should see slower growth, some industries such as the heating equipment and door and window industries should experience above-average growth in assembling activity since the use of subcontractors for supplying certain parts or performing certain finishing processes will result in an increase in the relative importance of assembling operations.

The trend over the last ten years toward greater use of specialized firms for certain services should continue over the projection period. In areas such as building security, building maintenance and transportation, work will continue to be contracted out to specialized companies. Over the next few years, however, this trend will also be true of a broad range of services from data processing (software development, hardware servicing) to financial auditing and engineering, management and advertising consulting. For some reason, secretarial and accounting duties (with the exception of auditing) have so far not been contracted out on a large scale.

4- EMPLOYMENT TRENDS

4.1 RECENT TRENDS

Like shipments, employment in the fabricated metal products sector experienced its strongest growth during the first half of the 1970s. Between 1971 and 1976 the number of jobs in the sector rose from 35,000 to 38,000, for average annual growth of 1.7%. And since this growth in employment was less rapid than growth in value added, labour productivity made significant gains in real terms over the period.

When the sector went through an economic downturn in 1976 and 1977, its employment level fell by 4,000 jobs before picking up again to 1980. Thus, on balance, while employment rose at an average annual rate of 1.7% annually between 1971 and 1976, no net growth was recorded during the following period from 1977 to 1981. With no net increase in employment, the sector was able to repeat the productivity gains it made from 1972 to 1976. This meant that over the period from 1972 to 1981, sector productivity rose at the rate of 1.7% annually.

The beginning of the 1980s was marked by a very sharp drop in employment which cut the number of jobs in the sector to its lowest level in 15 years. And while employment fell to 30,000 in 1983, this shedding of jobs did not fully offset the sharp decline in output. As a result, all the productivity gains made between 1975 and 1981 were lost during this period. At the end of 1986, sector employment was still 10% below its 1980 level.

4.2 FACTORS DETERMINING CHANGE BETWEEN 1971 AND 1981

In chapters 2 and 3, we examined two sets of factors that have a significant impact on employment trends in the sector. First, the "cyclical" factors are those which determine output levels and, for a given combination of factors of production, the quantity of labour input required. Second, the technological, technical and organizational factors are those that determine the sector's production function, that is, its make-up in terms of factors of production. This second set of factors is generally associated with the concept of labour productivity, here defined as value added per worker. However, this interpretation should be treated with caution, and to avoid any confusion, we shall refer to these factors as "structural".

For the purposes of our analysis, it would be interesting to be able to quantify the relative importance of these two effects, the cyclical and the structural, over the last few years. This exercise would help to identify certain employment trends resulting from the cyclical, technological, technical and organizational changes discussed earlier.

TABLE 4.1
EMPLOYMENT TRENDS IN THE QUEBEC
FABRICATED METAL PRODUCTS SECTOR
(thousands of jobs)
1971-1985

Year	'000	%	Year	'000	%
1971	35	-	1979	39	5.4
1972	36	2.9	1980	39	0.0
1973	36	0.0	1981	38	-2.6
1974	39	8.3	1982	34	-10.5
1975	38	-2.6	1983	30	-11.8
1976	38	0.0	1984	30	0.0
1977	34	-10.5	1985	31	3.3
1978	37	8.8	1986	35	12.9

Sources: Statistics Canada, Labour Force Survey
Statistics Canada, Manufacturing industries, Cat No 31-203
CEIC, Economic Services Branch, Quebec Region

TABLE 4.2
WORKER PRODUCTIVITY TRENDS* IN THE QUEBEC
FABRICATED METAL PRODUCTS SECTOR
(average annual growth rates)
1971-1983

	1972-76	1973-80	1972-81	1982-83
Employment	1.7	0.0	0.8	-11.1
Productivity	1.9	1.5	1.7	- 3.6

(*) Productivity = value added per worker

SOURCE: Statistics Canada, Manufacturing industries, Cat No 31-203

4.2.1 Assessing the Cyclical Effect

As defined above, the cyclical effect may be assessed by keeping the sector's specific combination of factors of production constant over time, with the level of output being the sole variable. Under these circumstances, the quantity of labour input must follow changes in output (except if there are possible economies of scale - a subject that we shall come back to later). Similarly, if the production structure remains constant, the employment structure too must remain constant.

Thus, from the 1971 census data we can first work out the occupational structure of the fabricated metal products sector, and we can then estimate the incidence of cyclical trends between 1971 and 1981 on each of the occupational groups in the sector by applying the rate of growth in output over this period to the employment level of each occupational group as it stood in 1971.

Between 1971 and 1981, output in the fabricated metal products sector increased 45%. If the combination of factors of production had remained the same, the sector's labour requirements would have risen to 51,400 by 1981, up 16,200 over 1971.

4.2.2 Assessing the Structural Effect

Of course, this growth in employment is purely theoretical; the sector's actual employment level in 1981 according to Statistics Canada was 38,000, which corresponds to average annual growth of 0.8% between 1971 and 1981. However, our theoretical figure enables us to estimate the incidence of the second set of factors on employment.

We can estimate the incidence on employment of the second set of structural factors by taking the difference between the estimated employment level if only output had changed between 1971 and 1981 and the actual employment level recorded in 1981. This difference will correspond to the reduction in labour requirements brought about by the technological, technical and organizational changes introduced over the period in question. Table 4.3 shows that these changes made it possible to reduce by around 13,100 the new labour requirements resulting from increased output and to keep employment growth down to 3,000 over the period.

It should be noted, however, that the stamped, pressed and coated metal products subsector accounted for nearly 70% of the structural effect on employment. A large proportion of this change can therefore be attributed to the structural change in production in this subsector.

4.2.3 Structural Effect and Productivity

The structural effect, as defined above, differs somewhat from the concept of labour productivity when the latter is equated with value added per worker. It refers instead to the slightly different concept of production value per worker. We chose this latter concept so that we could include in our analysis the probable effect on employment of the increasing use of outside contractors for providing certain services in the manufacturing sector. Since this phenomenon lowers the value added but not the value of output, it can be included in our estimate of the structural effect only if we use the concept of production value per worker in our analysis. Furthermore, while for overall labour input it still may be valid to interpret the structural effect as a measurement of labour productivity gains, the same cannot be said of using the interpretation for a specific occupational group.

Generally speaking, labour productivity can be changed in a number of ways: depreciation (or appreciation) of a factor of production, whether human or physical; economies (or diseconomies) of scale through a change in output volume; and adoption of a new production technique or organizational structure. A change in labour productivity can also be brought about by a change in the relative productivity of labour with respect to capital - a change that itself is the result of the introduction of new technology. This relative change in the productivity of labour in relation to capital will cause a substitution effect between these two factors of production, which in turn will cause an apparent change in labour productivity. This is why it is generally held that the productivity of the labour input is not independent of that of the capital input.

On the level of individual occupational groups, the labour-capital substitution is not the only one possible. Significant changes in relative productivity can alter the occupational structure in an industry by causing substitution to take place between occupational groups. Thus it would be misleading to interpret the results obtained by the estimating method outlined above according to the notion of productivity gains or losses.

4.3 EMPLOYMENT TRENDS BY MAJOR OCCUPATIONAL GROUP

Table 4.3 shows the results obtained for the major occupational groups. The groups the least involved in actual production activities suffered the biggest drops in employment owing to structural changes. This is particularly evident for the sales, clerical, and construction and transportation groups. These groups were all affected by negative structural factors that completely cancelled out the cyclical increase.

A variety of factors have contributed to change in these groups. The introduction of data processing and office automation technology, for instance, may well have deflated demand for clerical

staff. The sales groups seem to have suffered the consequences of a reorganization and economies of scale, for no one we consulted pointed to any technological changes affecting these groups. Workers in the building and transportation occupations seem to have suffered more than others from the increasing use of the services offered by independent firms specialized in these areas.

The very negative structural shift that affected machining occupations chiefly occurred in the stamped, pressed and coated metal products industries (304). The decrease in the number of machining jobs is closely linked to the major change, beginning in 1978, in the composition of this subsector's output, ie the very strong growth in coin production.

While the managerial occupations were on the whole less sensitive to structural changes, the technical support groups saw their share of total sector employment fall from 5.1% in 1971 to 3.8% in 1981. This meant a decline in absolute terms in the number of workers in these groups; the decline was particularly severe in the power boiler (301), structural metal products (302) and stamped metal products (304) industries.

Fabricating, assembling and repairing occupations are the only occupational group that has enjoyed a structural increase in employment. These workers greatly benefited from accelerated growth in assembling activities in a number of industries and from technological changes that have increased demand for people in labouring occupations. Only the stamped metal products (304) and machine shop (308) subsectors experienced a structural drop in employment in this major occupational group.

TABLE 4.3
EMPLOYMENT TRENDS BY MAJOR OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR
1971-1981

OCCUPATIONAL GROUP	Numbers		Structural Impact	Cyclical Impact	Relative Share	
	1971	1981	1972-1981	1972-1981	1971	1981
Managerial and professional	2,060	2,600	-300	840	5.9	6.9
Technical support	1,775	1,455	-1,009	685	5.1	3.9
Clerical	4,660	4,395	-2,274	2,009	13.2	11.7
Sales	1,710	1,255	-1,208	755	4.9	3.3
Services, forestry and mining	375	400	- 172	194	1.1	1.1
Processing	2,015	2,765	- 313	1,062	5.7	7.3
Machining	13,085	15,190	-3,961	6,062	37.2	39.6
Fabricating, assembling and repairing	3,480	5,370	568	1,322	9.9	14.2
Construction, transportation, material handling and other	6,030	4,570	-4,710	3,250	14.5	10.4
TOTAL	35,190	38,000	-13,381	16,180	100.	100.

SOURCE: Statistics Canada, Census of Canada, 1971 and 1981

5- EMPLOYMENT PROSPECTS BY OCCUPATIONAL GROUP

5.1 METHODOLOGY

In this chapter we analyse employment trends for the main occupational groups in the fabricated metal products sector. For each of the groups we have applied the methodology outlined in the preceding chapter for the intercensal period from 1971 to 1981. We have attempted as much as possible to link the results of that exercise with the impact on each occupational group of the various factors determining structural change identified in the first part of this profile.

A first step in projecting future labour requirements by occupational group consisted in determining what the employment level would be in 1992 if the cyclical effect alone played a role over the next few years. From the same theoretical perspective, we estimated what this level would be in 1992 if the structural trend observed from 1971 to 1981 were to continue.

On the basis of these two points of reference - that is the employment trend from 1971 to 1981 and the change in the structural factors that should affect the various occupational groups over the next few years - we forecast what course we thought employment in the groups would take to 1992. In this respect, the comments we received to our industry questionnaire provided us with a great deal of raw information about occupational trends. For those occupations for which no specific information regarding the employment outlook was available, we assumed that they would follow the general trend of the sector.

We would like to stress the qualitative nature of the occupational analysis presented in this chapter. Attention should be focused on the relative, rather than the absolute levels of the employment projections for each occupational group.

5.2 MANAGEMENT OCCUPATIONS

Between 1971 and 1981, management personnel saw swifter overall employment growth than the sector as a whole. From 5.9% in 1971, the group's share of total sector employment rose to 6.8% in 1981.

Trends for Managers and Administrators (113-114) differed, however, from those for Administrative Officers (117). Whereas the former occupations benefited from certain organizational changes, employment in the latter group seems to have been affected by a new strategy toward the duties performed by these professionals.

TABLE 5.1

RECENT AND PROJECTED EMPLOYMENT TRENDS BY OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR
1971-1992

MANAGEMENT OCCUPATIONS

CCDO	OCCUPATION	RECENT TREND				PROJECTION		
		JOBS 1971	VARIATION 1971-81 CYCL.	VARIATION 1971-81 STRUC.	JOBS 1981	VARIATION 1981-92 CYCL.	VARIATION 1981-92 STRUC.	JOBS 1992
1130	GENERAL MANAGERS	381	187	-299	268	55	-53	270
1131	MANAG NAT SCIENCES	14	6	-6	14	3	-3	15
1132	MANAG SOC SCIENCES	0	0	9	9	3	-2	10
1133	ADMIN. TEACHING	4	-1	-4	0	0	0	0
1134	ADMIN. MEDICINE	0	0	4	4	1	-1	5
1135	FINANCIAL MANAGERS	30	3	27	60	14	-14	60
1136	PERSONNEL MANAGERS	82	32	-11	103	19	-32	90
1137	SALES MANAGERS	204	89	24	317	68	-115	270
1141	PUCHASING MANAGERS	17	10	32	60	16	15	90
1142	SERVICES MANAGERS	0	0	5	5	1	-7	0
1143	PRODUCTION MANAGERS	154	59	595	808	194	-103	900
1145	CONSTRUCTION MANAGERS	19	11	38	67	15	-32	50
1147	TRANSPORT MANAGERS	8	1	2	11	3	-8	5
1149	MANAGERS NEC	191	59	14	264	61	-75	250
1171	ACCOUNTANTS AUDITORS	508	220	-373	355	83	-73	365
1174	PERSONNEL OFFICERS	94	54	-124	24	6	-10	20
1175	PURCHASING OFFICERS	168	61	-43	186	40	-21	205
1176	INSPECTORS NON GOVER	5	1	12	18	4	-1	20
1179	MANAG ADMIN NEC	183	49	-205	27	5	-22	10
	TOTAL	2061	841	-302	2600	590	-555	2635

5.2.1 Managers and Administrators

In contrast to the structural upward trend in employment among most managers and administrators, General Managers and Other Senior Officials (1130) saw their numbers decrease. The most significant factor of change in this group seems to be an increased division of labour within the firm, resulting in greater job specialization for these professionals. Besides favouring the transfer of General Managers (1130) to more specialized occupational groups (1131 to 1149), this increased division of labour also resulted in the creation of many middle management positions.

This inflationary trend in the number of managerial positions should reverse itself over the next few years. In view of greater decentralization of decision-making responsibility and elimination of middle management positions, we forecast that overall employment in these groups will remain at 1981 levels.

Certain specialized management occupations such as Production Managers (1143) and Purchasing Managers (1141) should see slightly swifter growth than the average for management occupations. Production managers will be given greater responsibility and will play a central role in company reorganization. Purchasing managers will be more and more in demand as companies make much more determined efforts to control the cost of raw materials (acquisition and inventory costs) and as they contract more work out to other firms (procurement of special services, subcontracts for parts, etc).

Employment among Sales and Advertising Managers (1137) should drop substantially owing to greater use of independent manufacturer's agents and increased contracting out of work to advertising agencies.

Although developments in computer technology represent major innovations for the managerial occupations, the respondents to our industry questionnaire do not think that this technology will significantly alter the nature of the duties performed by these professionals. However, since the technology is fairly easy to learn to use, it should encourage managers to make use of information hitherto inaccessible and tend to increase analysis and planning activities.

5.2.2 Administrative Officers

The structural trend for the administrative officer occupations, in contrast to that for managers and administrators, was negative between 1971 and 1981. In particular, the number of Financial Officers (1171) fell by 30%, while output rose by 30%. Economies of scale were to some extent responsible for this drop but they alone cannot explain the trend. The greater tendency among manufacturing companies to contract accounting and auditing work out to specialists and the new data processing technology now available have had a major impact on demand for this occupational group.

TABLE 5.2

RECENT AND PROJECTED EMPLOYMENT TRENDS BY OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR
1971-1992

TRECHNICAL SUPPORT OCCUPATIONS

CCDO	OCCUPATION	RECENT TREND				PROJECTION		
		JOBS 1971	VARIATION 1971-81 CYCL.	VARIATION 1971-81 STRUC.	JOBS 1981	VARIATION 1981-92 CYCL.	VARIATION 1981-92 STRUC.	JOBS 1992
2111	CHIMISTS	35	21	-46	10	2	-3	10
2117	PHYS SCI TECH	44	33	-64	12	3	-0	15
2119	OCC PHYS SCIENCES	35	17	-52	0	0	0	0
2131	AGRICULTURISTS	5	1	-6	0	0	0	0
2141	ARCHITECTS	7	4	9	20	6	3	30
2142	CHEMICAL ENGINEERS	0	0	9	9	2	-1	10
2143	CIVIL ENGINEERS	174	99	-165	108	22	-31	100
2144	ELECTRICAL ENGINEERS	29	6	-21	15	3	-3	15
2145	INDUSTRIAL ENGINEERS	175	36	-80	131	24	-25	130
2147	MECHANICAL ENGINEERS	201	22	-111	112	22	-4	130
2151	METALLURG ENGINEERS	46	22	-31	36	6	-8	35
2153	MINING ENGINEERS	5	7	-12	0	0	0	0
2155	AERONOTICAL ENGINEERS	8	3	-10	0	0	0	0
2159	ARCHIT ENGINEERS NEC	0	0	5	5	1	-2	5
2160	SURPERV ARCHIT ENGIN	0	0	57	57	13	10	80
2161	SURVEYORS	0	0	5	5	1	-1	5
2163	DRAUGHTSMEN	560	203	-275	488	104	-62	530
2165	ARCHIT ENGIN TECHN	85	31	-22	94	22	-1	115
2169	OTHERS ARCHIT ENGIN	8	1	-5	4	1	0	5
2181	MATH STAT ACTUARIES	5	7	-12	0	0	0	0
2183	ANALYSTS PROGRAMMERS	57	31	-2	86	21	-16	90

2311	ECONOMISTS	15	3	-8	10	2	-2	10
2319	OCCUPATIONS SOC SCI	5	7	-12	0	0	0	0
2333	OCC WELFARE COMM SERV	7	4	-11	0	0	0	0
2353	TECH IN LIBR MUSEUM	7	4	-11	0	0	0	0
2797	INSTRUCTORS NEC	0	0	28	28	7	-0	35
3131	NURSES GRADUATE	13	10	-3	20	5	-5	20
3135	NURSING AIDES	0	0	5	5	-0	0	5
3155	RADIOLOGIST TECHN	5	7	-12	0	0	0	0
3313	DESIGNERS	203	70	-147	127	24	-51	100
3314	ILLUSTRATING ARTISTS	25	18	-24	20	3	-2	20
3330	PRODUCERS DIRECTORS	0	0	5	5	1	-2	5
3332	MUSICIANS	0	0	5	5	2	-2	5
3333	CHOREG DANCERS	0	0	5	5	1	-1	5
3352	WRITERS EDITORS	12	12	-11	13	3	-1	15
3355	TRANSLATORS INTERPRE	0	0	15	15	0	4	20
3359	OCC IN WRITIND NEC	0	0	5	5	1	-2	5
3375	ATTENDANTS SPORT RECR	8	3	-10	0	0	0	0
	TOTAL	1777	685	-1009	1454	304	-207	1550

As we have mentioned in the preceding chapters of this profile, automation of accounting procedures is one of the most advanced aspects of EDP technology. Since the main impact of the introduction of this technology has been felt over the last few years, we do not anticipate as large a structural drop in employment over the projection period. Contrary to the other administrative groups, Financial Officers will see the nature of their duties changed considerably through the introduction of computer technology. These employees are regularly called upon to adapt or improve existing accounting software to suit company needs and are often used as resource persons in the development of accounting systems. Freeing them of routine duties means that they can devote more of their energy to analysing financial data in order to give expert advice on tax, cost control and other questions.

5.3 TECHNICAL SUPPORT OCCUPATIONS

The small share of total sector employment held by technical support staff reflects the limited volume of research and development activity conducted by sector firms. Moreover, the occupational breakdown of technical support staff shows sector R&D is chiefly oriented toward production support rather than product design.

The nature of technical support work very often allows companies considerable latitude in satisfying their requirements for this type of personnel, including the use of outside contractors offering special services. The small size of many sector companies often makes it impossible for them to justify employing technical support specialists on a permanent basis. The difficulties involved in recruiting qualified technical personnel constitute another important factor in favour of contracting technical work out to independent consultants. The existence of private consulting firms working in a wide variety of technical support fields has meant that many sector companies have been able to contract work out to specialized firms on an irregular basis according to their needs.

The possibility of contracting work out has had a major impact on employment trends in the occupational groups involved in engineering, data processing, product design and, to a lesser degree, technical drawing. Thus, Industrial (2145), Civil (2143) and Mechanical (2147) engineers, as well as Architectural and Engineering Technologists and Technicians (2165), Draughting Occupations (2163) and Product and Interior Designers (3313) all suffered a strong negative structural effect between 1971 and 1981. In addition, despite extensive development of computer systems in most sector companies, the number of permanent jobs for Systems Analysts (2183) increased by only 30 or so positions.

Since the factors that determined this trend in the 1970s have not changed appreciably, it should continue in much the same way over the projection period. Because of the increasing emphasis on the efficiency of production equipment and the highly specialized nature of this equipment, demand should increase in the technical occupations involved closely in equipment design.

We therefore expect a slight drop in the number of Civil and Industrial Engineers. In spite of the growing importance given to product design, this type of work will increasingly be contracted out, thus reducing demand within the sector for Product and Interior Designers (3313). Similarly, we do not anticipate that Systems Analysts (2183) should see strong employment growth over the projection period.

Employment among Mechanical Engineers should grow at about the same rate as sector output. Workers in Technical Draughting Occupations, who are chiefly involved in designing tools, should also profit from increased demand for this type of activity.

We have already noted that computer-aided technology has not been acquired on a wide scale in the fabricated metal products sector. Given the nature and relatively limited volume of technical drawing done in the sector, this technology should not penetrate the sector to any large extent over the next few years, according to industry responses to our questionnaire. Only the ornamental metal products industries and some very specialized machine shops have good potential for integrating this type of technology into their operations. Sector firms will therefore continue to require workers skilled in traditional draughting techniques. However, some respondents to our questionnaire reported that they had encountered problems recruiting skilled, experienced personnel in the area of design drawing. This gap in the labour market may prompt sector companies to contract such work out to independent firms. All in all, we anticipate moderate growth in this occupational group to 1992.

Architectural and Engineering Technologists and Technicians (2165) and Architects (2141) are chiefly concentrated in the sector's ornamental and architectural metal products industries. These occupational groups have benefited over the last few years from increased efforts to develop new products. This trend should continue over the projection period, with employment in the two groups growing at a somewhat faster rate than the sector as a whole.

5.4 CLERICAL OCCUPATIONS

The administrative suppport or clerical groups are those that are usually pinpointed as being the most affected by office automation. Word processing, automated inventory management, electronic mail and automated bookkeeping are just some of the new technological developments that may influence employment trends in these groups.

These technological developments mean that the clerical occupations will undergo extensive qualitative and quantitative change over the next few years. Indeed, this process of change is already well advanced, since between 1971 and 1981 the administrative support groups experienced a drop in employment of 17%: this can be compared with a 45% increase in output and an 8% increase in total sector employment over the ten-year period.

TABLE 5.3

RECENT AND PROJECTED EMPLOYMENT TRENDS BY OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR
1971-1992

CLERICAL OCCUPATIONS

CCDO	OCCUPATION	RECENT TREND				PROJECTION		
		JOBS 1971	VARIATION 1971-81 CYCL.	VARIATION 1971-81 STRUC.	JOBS 1981	VARIATION 1981-92 CYCL.	VARIATION 1981-92 STRUC.	JOBS 1992
4111	SECRETARIES STENO	948	345	-502	790	181	-171	800
4113	TYPISTS STENO-TYPISTS	159	64	-99	125	28	-52	100
4130	SUPERV BOOKKEEPING	46	30	-40	36	10	-11	35
4131	BOOKKEEPERS	941	375	-54	1262	290	-352	1200
4133	TELLERS CASHIERS	25	7	-24	8	1	1	10
4135	FINANCE CLERKS	4	-1	-4	0	0	0	0
4137	STATISTICAL CLERKS	5	7	-6	7	1	-3	5
4139	OCC ACCOUNT-RECOR NEC	5	2	-3	4	1	-5	0
4140	SUPERV OFFICE MACHINE	25	3	-28	0	0	0	0
4141	OFFICE MACHINE OPERAT	48	31	-48	30	6	-6	30
4143	ELECTRO DATA PROC OPE	68	38	47	153	36	-38	150
4150	SUPERV MATERIAL RECOR	117	49	-31	134	32	-42	125
4151	PRODUCTION CLERKS	180	100	-164	116	29	25	170
4153	SHIPPING CLERKS	629	315	-280	664	156	-120	700
4155	STOCK CLERKS	290	108	11	409	87	-46	450
4157	WEIGHERS	32	26	-21	36	7	-8	35
4159	MATERIAL RECORD NEC	8	1	-9	0	0	0	0
4161	LIBRARY FILE CLERKS	27	6	-18	15	2	-12	5
4170	SUPERV RECEPTION	0	0	5	5	1	-1	5
4171	RECEPTIONNISTS	105	36	-38	103	26	-24	105
4173	MAIL POSTAL CLERKS	12	12	-19	5	1	-6	0

4175	TELEPHONE OPERATORS	19	22	-22	19	5	-4	20
4177	MESSENGERS	33	15	-37	11	2	-13	0
4179	INFORMATION NEC	33	9	3	45	12	-3	55
4190	SUPERV CLERKS NEC	149	85	-219	15	4	-13	5
4191	COLLECTORS	12	-5	17	24	5	-14	15
4192	ADJUSTERS CLAIM	10	4	-14	0	0	0	0
4195	PERSONNEL CLERKS	0	0	4	4	1	-1	5
4197	GENERAL OFF CLERKS	647	288	-625	310	72	-282	100
4199	CLERKS NEC	85	37	-58	63	13	-46	30
	TOTAL	4660	2009	-2274	4395	1009	-1249	4155

5.4.1 General Office Clerks

During the 1970s it was the least specialized occupational groups that suffered the most from change. Thus, General Office Clerks (4197), Other Clerical and Related Occupations, nec (4199) and their Supervisors (4190) saw a sharp reduction in their numbers. Part of this drop was due to a shift in duties from these employees and to Bookkeepers (4131) and Stock Clerks (4155), who experienced strong growth over the same period. However, the structural increase in the last two groups is only slight compensation for the drop suffered by the first three - an indication of just how precarious the employment situation has become for General Office Clerks and related occupations.

The repetitive tasks performed by these workers are among those that are the easiest to automate through data processing or other electronic technology. The development of microcomputer technology over the next few years should further cut labour demand in these occupational groups through gradual automation of the tasks of transcribing and compiling information and producing written communications. Between 1981 and 1992 these groups should therefore follow the same trajectory as that recorded in the 1970s. From the 1981 level of 390, employment in these three groups is likely to fall to 135 by 1992.

5.4.2 Specialized Office Clerks

Automation of repetitive tasks through the development of microcomputer technology should also begin to affect other occupational groups that have so far remained untouched by technological advances. One of these groups is Bookkeepers (4131). Between 1971 and 1981, their numbers increased faster than the sector as a whole; during the projection period, however, they should experience the reverse trend. Most accounting software packages now make it possible to automate operations such as cost accounting, preparation of financial statements and calculation of wage deductions, besides considerably reducing the number of postings that have to be made. The use of computer technology also makes it easier to integrate bookkeeping into the routine operations of preparing orders billing, making payments, etc.

EDP technology thus helps to integrate a range of tasks that were hitherto separated into the duties of bookkeeping, accounting, billing and so on. But clerical jobs are not being affected solely by computer technology: improved banking services, such as detailed account statements, which facilitate bookkeeping, and electronic funds transfer, which make payroll and accounts payable operations much easier, are also having a major impact. On balance, we anticipate that the downward structural trend will be fully offset by the increased activity generated by cyclical growth as well as greater availability of statistical data. From its 1981 level of 1,260, employment in this occupational group should not dip below 1,200 through to 1992.

The duties of Stock Clerks (4155) may also be significantly changed by computer technology. Applications such as perpetual inventory, automatic calculation of optimum inventory levels on the basis of stock turnover, and easier record and file management (for keeping track of products, prices, suppliers, etc) should all tend to reduce demand in this occupational group. Between 1971 and 1981, employment in the group grew faster than the sector as a whole because companies began to realize that better inventory management was essential for cutting operating costs. As a result of the greater importance given to stock control, the number of people employed in this group should increase slightly over the projection period, despite more extensive use of computer technology.

Shipping and Receiving Clerks (4153) saw slower growth than the overall sector as the structural employment effect on the group virtually cancelled out economic growth. Unfortunately we were unable to gather any information specifically about this occupational group; however, it so far does not appear to have been much affected by technical or technological changes. Thus we are forecasting that over the projection period, employment in the group will follow the same trend as from 1971 to 1981.

Production Clerks (4151) suffered a significant drop in employment from 1972 to 1981. It seems that the duties of co-ordinating and monitoring production processes have been taken over directly by Production Managers, whose numbers shot up during the 1970s. Over our projection period, the administrative reorganization that should bring about more decentralized decision-making and transfer more responsibility to Production Managers may boost growth in demand for Production Clerks.

Demand will be strongest for the more specialized occupations in the group, ie those involved in co-ordinating and monitoring production processes. Like the other clerical occupations, these employees will have to work with computer technology and will have to acquire new skills to operate production equipment.

Employment among Receptionists and Information Clerks (4171) remained stable from 1972 to 1981. We anticipate a similar trend for this group over the projection period.

The remaining groups of specialized office clerks in the sector are those involved in the operation of office machines and EDP equipment (4140, 4141, 4143). These groups were harldy affected by structural changes in employment between 1972 and 1981, and their numbers have grown at about the same rate as the industry.

Chiefly employed for operating large computer systems, most of these workers are concentrated in a small number of big firms. Foreseeable developments in computer technology for the next few years should not increase demand in these occupational groups. In fact, the greater "user friendliness" of office machines should tend to reduce the need for workers specialized in the operation of equipment such as postage meters, photocopiers, printers and card sorters. For the same reasons, computer

operators should not see their numbers increase significantly over the projection period.

5.4.3 Secretaries and Typists

Secretaries and Stenographers (4111), who form the largest single clerical group, saw their numbers decline by 16% between 1971 and 1981. Typists (4113) also suffered a decrease in their numbers of 21% over the same period.

The respondents to our industry questionnaire attribute this drop in real terms to an organizational change favouring the transfer of certain duties to the various groups of clerks. The new advances in electronic records management technology also seem to have played a significant role in this decline.

Over the next few years the elimination of middle management positions should mean that this trend will continue. On the other hand, we do not anticipate that more extensive use of office automation technology will have a major impact on employment among secretaries and typists. Given the type of secretarial work required in sector companies, it does not seem that word processing systems will be introduced on a large scale throughout the sector. However, secretaries will still have to acquire new technical skills to take full advantage of the equipment they are asked to operate.

5.5 SALES OCCUPATIONS

The sales departments of sector firms seem to have undergone considerable restructuring between 1971 and 1981. This reorganization was marked by a drop in the number of Sales Supervisors (5130) and a jump in that of Sales and Advertising Managers (1137).

Employment growth among Commercial Travellers (5133) and a decline in the number of Sales Workers, Commodities, nec (5135) and Technical Sales Employees (5131) are further signs of this reorganization. This relative change of the three largest occupational groups in sales reflects a switch in marketing strategy toward more individualized, longer-term relationships with customers.

This new orientation of sector sales forces provides only a partial explanation for the overall structural drop in these three occupational groups. Indeed, a number of factors have moderated growth in demand for these skills. The use of promotional tools that reach a wider audience, such as specialized journals and trade fairs, has made it much easier to identify potential customers. Two other significant factors influencing employment trends in these groups are the growing number of firms contracting sales work out to manufacturer's agents and the economies of scale that are possible in this area.

TABLE 5.4

RECENT AND PROJECTED EMPLOYMENT TRENDS BY OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR
1971-1992

SALES OCCUPATIONS

CCDO	OCCUPATION	RECENT TREND				PROJECTION		
		JOBS 1971	VARIATION 1971-81 CYCL.	VARIATION 1971-81 STRUC.	JOBS 1981	VARIATION 1981-92 CYCL.	VARIATION 1981-92 STRUC.	JOBS 1992
5130	SUPERV SALES	520	198	-589	130	28	-83	75
5131	TECHNICAL SALESMEN	64	19	-29	54	12	-16	50
5133	COMMERCIAL TRAVELLERS	643	304	-224	723	170	-22	870
5135	SALESMEN NEC	396	177	-269	304	72	-126	250
5141	STR VENDOR D-TO-D SAL	30	15	-34	10	1	-2	10
5149	SALES COMMODITIES NEC	6	-3	16	20	5	-5	20
5170	SUPERV SALES (SERV)	5	1	-6	0	0	0	0
5174	ADVERTISING SALESMEN	13	9	-16	5	1	-2	5
5190	SUPERV OTHERS SALES	5	7	-12	0	0	0	0
5193	DRIVER-SALESMEN	23	19	-42	0	0	0	0
5199	SALES OCC NEC	5	7	-3	10	4	-4	10
	TOTAL	1709	755	-1208	1256	294	-260	1290

The projection period should not differ substantially from the employment trends recorded between 1971 and 1981. We anticipate slightly slower growth than in the sector as a whole, with Commercial Travellers (5133) enjoying the largest increase.

We should also mention that with this new sales strategy employers have begun to require greater technical know-how of their sales staff. Employees are also expected to know more about market analysis, sales forecasting, and planning. Moreover, since these workers constitute the prime intermediaries between a firm and its customers, they are increasingly being given responsibility for co-ordinating relations with customers. Thus, it is not surprising that more and more business administration graduates are being recruited to fill these positions.

5.6 PROCESSING OCCUPATIONS

Processing workers in the sector are chiefly concentrated in the Metal Processing and Related Occupations groups (8130 to 8149). In 1981 close to 90% of all processing workers belonged to these groups.

Between 1972 and 1981, the overall structural effect on these occupational groups caused the loss of only 200 jobs, or scarcely 7.5% of the 1981 employment level. However, major changes have occurred in the occupational make-up of these groups, with many specialized jobs being modified into labouring jobs. In 1981, over one third of all workers in these groups were labourers, compared with less than 7% in 1971.

The almost complete abandonment of castings in favour of the use of sheet metal, making it easier to meet desired specifications, has meant that many sector firms have been able to reduce their labour requirements in the Metal Smelting (8131), Rolling (8135) and Related Processing (8149) occupations. At the same time, this switch has stimulated demand in the Inspecting, Testing, Grading and Sampling Occupations (8146) and among Labourers (8148), engaged chiefly in handling the raw materials used in metal processing.

In the integrated industries (especially the wire and wire products industries), improved steel casting processes and the introduction of computer-controlled electric furnaces have also had the effect of reducing demand for the occupational groups mentioned above.

Concentrated in the hardware, tool and cutlery industries, the Moulding, Coremaking and Metal Casting Occupations (8137) saw more advanced automation of their duties because of generally longer production runs. The structural drop in employment in the Plating, Metal Spraying and Related Occupations (8143), which are chiefly found in the stamped, pressed and coated metal products industries (304), seems essentially to be due to slower growth in this type of activity in comparison with stamping and pressing.

Although the impact of technical and technological changes has for the most part already been absorbed, the announced investment in the modernization of production equipment at Sidbec Dosco (upgrading of furnaces and introduction of a continuous production process) should continue to slow growth in demand for Metal Processing and Related Occupations, nec (8149) and for Metal Smelting, Converting and Refining Occupations (8131). The Metal Extruding and Drawing Occupations (8141), which until now have been little affected by new technological developments, may well feel the impact of greater automation over the next few years.

While some respondents to our industry questionnaire pointed to a trend toward the integration of quality control operations and production operations, the nature of the tasks performed by processing workers in most sector firms rules out the possibility of a substantial reduction in labour needs in this area. We therefore anticipate that the number of workers in these groups will stabilize at its 1981 level. Finally, labourers in metal processing, who are chiefly engaged in handling raw materials in most sector industries, should see employment growth comparable with overall growth in sector output.

5.7 MACHINING OCCUPATIONS

Machinists form the largest employee category in the fabricated metal products sector, accounting for close to 40% of total employment in 1981. Between 1971 and 1981 these occupations experienced slightly swifter growth than overall employment in the sector. In absolute terms, however, they represent one of the occupational groups that has been the most affected by structural changes.

Employment trends, particularly structural, in these groups are linked with trends in the introduction of computer-controlled production processes, mechanical or electronic automation of these processes, and robotics. These occupations are therefore at the centre of the debate about the impact of the major technological changes that have been announced for the next few years in many areas of industry.

5.7.1 Metal Machining Occupations

The occupational structure of the metal machining groups is essentially determined by Machinists (8313), Machine-Tool Operating Occupations (8315), and Metal Machining Occupations, nec (8319). Besided experiencing very different trends in employment, these groups are affected by factors of change that differ widely from one industry to the next and according to the type of activity they are involved in.

It is important to distinguish between very specialized, repetitive machining operations done on an integrated assembly line and generally more complex, more diversified operations done in a machine shop. While both types of machining can be extensively automated, in

TABLE 5.5

RECENT AND PROJECTED EMPLOYMENT TRENDS BY OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR
1971-1992

PROCESSING OCCUPATIONS

CCDO	OCCUPATION	RECENT TREND				PROJECTION		
		JOBS 1971	VARIATION 1971-81 CYCL.	VARIATION 1971-81 STRUC.	JOBS 1981	VARIATION 1981-92 CYCL.	VARIATION 1981-92 STRUC.	JOBS 1992
8110	FOREMEN IN MINERAL	10	4	-5	9	2	-1	10
8111	CRUSHING GRINDING OCC	4	-1	6	9	2	-1	10
8113	MIXING SEPARATING OCC	8	1	-4	5	1	-2	5
8118	LABOURING MINERAL	17	8	-15	10	2	-2	10
8130	FOREMEN METAL PROCESS	306	187	-126	367	82	-114	335
8131	METAL SMELTING	164	75	-139	100	23	-34	90
8133	METAL HEATING TREAT	106	33	-7	131	32	-18	145
8135	METAL ROLLING OCC	62	37	-66	33	8	-6	35
8137	MOULDING COREMAKING	161	68	-89	139	38	-17	160
8141	METAL EXTRU DRAWING	151	73	2	227	47	-33	240
8143	PLATING METAL SPRAY	161	164	-75	250	61	-11	300
8146	INSP TEST MET PROCESS	5	7	121	133	30	-28	135
8148	LABOURING MET PROCESS	113	57	633	803	185	-88	900
8149	METAL PRECESS NEC	477	228	-455	250	57	-108	200
8150	FOREMEN CLAY GLASS	13	9	-16	5	2	-2	5
8151	FURNACEMEN KILNMEN	18	-3	11	26	1	-2	25
8153	SEPARATING GRINDING	8	3	-10	0	0	0	0
8155	FORMING OCC	17	-4	-5	8	2	0	10
8156	INSP TEST CLAY GLASS	0	0	5	5	1	-2	5
8158	LABOURING CLAY GLASS	0	0	4	4	1	0	5
8159	CLAY GLASS NEC	37	19	-51	5	1	-2	5

8160	FOREMAN CHEMICAL	12	4	-3	13	3	-1	15
8161	MIXING BLENDING CHEM	27	19	-5	41	9	-4	45
8171	CRUSHING GRINDING CHE	8	1	-5	4	1	-1	5
8173	COATING CALEND CHEM	5	1	2	8	1	1	10
8176	INSP TESTING CHEMICAL	13	10	-13	9	2	-2	10
8178	LABOURING CHEMICAL	0	0	8	8	2	-0	10
8179	CHEMICAL NEC	12	3	-4	10	2	-3	10
8213	BAKERS	0	0	11	11	2	-3	10
8215	SLAUGHTERING MEAT CUT	32	26	-52	5	1	-1	5
8217	FISH CANNING	0	0	5	5	1	-2	5
8223	MILK PROCESSING	5	7	-12	0	0	0	0
8226	INSP TEST FOOD BEVER	0	0	11	11	3	-3	10
8228	LABOURING FOOD BEVER	0	0	11	11	3	-3	10
8230	FOREMEN WOOD PROCESS	0	0	5	5	1	-2	5
8233	PLYWOOD MAKING	0	0	14	14	4	-3	15
8235	WOOD TREATING	8	3	-10	0	0	0	0
8236	INSP TEST WOOD PROCES	0	0	16	16	4	-0	20
8238	LABOURING WOOD PROCES	0	0	5	5	1	-2	5
8250	FOREMEN PULP PAPER	0	0	3	3	0	-3	0
8258	LABOURING PULP PAPER	0	0	4	4	1	0	5
8260	FOREMEN TEXTILE	8	3	-10	0	0	0	0
8263	SPINNERS TWISTERS	0	0	5	5	1	-1	5
8267	WEAVING OCC	30	11	6	46	9	-0	55
8275	FINISHING TEXTILE	14	7	-21	0	0	0	0
8278	LABOURING TEXTILE	0	0	5	5	1	-1	5
8279	TEXTILE NEC	5	2	-7	0	0	0	0
8296	INSP TEST PROCESS NEC	0	0	4	4	1	0	5
	TOTAL	2016	1062	-313	2765	635	-505	2895

each case the type of automation is very different. Whereas automation of the first type of activity entails mechanization of the rate of feed and the organic links between the various machine tools, automation of the second means mechanizing actual machining operations. It is this latter type of automation that is generally being referred to in connection with numerically controlled machine tools. In both types of automation, however, the scale of the production runs in question is crucial in determining whether automation is worth the investment.

The second type of machining, which chiefly concerns the maintenance and repair of production equipment, did not undergo any major changes in most sector industries between 1972 and 1981. Only the machine shop, tool and other metal fabricating industries have invested substantially in numerically controlled machine tools. Several sector firms have also upgraded the equipment they use for the first type of machining, according to the scale of their production runs. The stamped metal products (304), wire products (305), hardware (306) and ornamental metal products (303) industries have devoted considerable resources to this type of upgrading.

These recent developments in the industry have had a major impact on employment trends in the machining occupations. While the number of Machinists (8313) has been stabilizing in companies that are reluctant to invest in numerically controlled machine tools, a sharp increase in demand has occurred in firms that are using this new technology. Throughout the sector a decline in demand for workers in Machine Tool Operating Occupations (8315) has been recorded, though it has been partially offset by a rise in the number of Metal Machining Occupations, nec (8319).

These employment statistics substantiate an observation made by a majority of the respondents to our industry questionnaire, ie that improvements to production equipment (automation, numerical control, integration of operations, better organic links between machines, etc) are tending to cause a division of the tasks traditionnally performed by Machine Tool Operators. A first set of tasks, involving the control and operation of machinery, is being shifted to more qualified workers who can make the necessary adjustments to the equipment during production. In the case of numerically controlled machine tools, these tasks are generally being transferred to Machinists (8313). In the case of other machines, the trend is to shift these duties to Industrial Machinery Mechanics (8584). The second set of tasks, which concerns the monitoring of production and feed operations, is stimulating demand in the Metal Machining Occupations, nec (8319). Throughout our projection period, employment in these three occupational groups should follow the same trend as during the previous ten-year period. However, given that many changes have already been implemented in some subsectors, their impact should not be as great between now and 1992.

Continuing investment in numerically controlled machine tools by firms in the tool and machine shop industries should translate into moderate growth in employment among Machinists (8313), despite the

fact that their numbers have stabilized in the other industries that make up the sector. Even if only 40% of the machining activity in these industries is susceptible of being upgraded through investment in NCMTs, the low level of penetration of this type of technology (as of 1981) means that there is plenty of room for improvement in this area over the next few years.

In conjunction with these investments, the upgrading of production equipment in the other industries of the sector should result in a shift in labour demand from Machine Tool Operators (8315) to less qualified workers in the Metal Machining Occupations, nec (8319). As in recent years, this downgrading of Machine Tool Operating Occupations will likely go hand in hand with a shift of machine-operating duties to the Industrial Machinery Mechanics (8584) group.

In addition to the occupational groups directly associated with production, the Inspecting and Testing Occupations, Metal Machining group (8316) also enjoyed rapid growth in employment between 1971 and 1981. Although greater importance will be give to inspecting and testing over the next few years, transferral of these duties to Machinists, Other Metal Machining Workers, and Industrial Machinery Mechanics will result in a fall in demand for these occupations.

5.7.2 Metal Shaping and Forming Occupations

In contrast to the machining occupations, the metal shaping occupations all experienced employment growth over the period from 1972 to 1981. Except in the case of the Inspecting and Testing Occupations (8336), however, this growth was slower than overall growth in production.

Welding and Flame Cutting Occupations (8335), the largest single occupational group in this category, experienced employment growth of only 18% over the ten-year period. These workers are present in all sector industries, but their employment growth was slowed in particular by a drop in their numbers in the stamped metal products (304) and power boiler and heat exchanger (301) industries. The nature of the welding operations in these two subsectors has made it possible to automate many of these operations in recent years. While the technology for automating these activities in most industries is already available, the small scale of production sets strict limits on the profitability of investing in this technology.

If, on the whole, very few changes in the nature of welding and flame cutting work are expected, welders employed in the fabricated structural metal products industrie (302) may see their duties merged with those of factory assembly workers in the course of our projection period. This means that workers in these industries will be required to be more skilled in reading blueprints. The Canadian Institute of Steel Construction is considering setting up a course that could be integrated into the Ministry of Education's vocational training program. Factory

TABLE 5.6

RECENT AND PROJECTED EMPLOYMENT TRENDS BY OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR
1971-1992

MACHINING OCCUPATIONS

CCDO	OCCUPATION	RECENT TREND				PROJECTION		
		JOBS 1971	VARIATION 1971-81 CYCL.	VARIATION 1971-81 STRUC.	JOBS 1981	VARIATION 1981-92 CYCL.	VARIATION 1981-92 STRUC.	JOBS 1992
8310	FOREMEN METAL MACHIN	517	161	-96	581	106	-58	630
8311	TOOL DIE MAKING	428	120	-153	395	92	-48	440
8313	MACHINISTS	2042	481	-129	2394	368	-142	2620
8315	MACH TOOL OPERATING	2288	854	-2109	1033	216	-399	850
8316	INSP TEST METAL MACHI	59	27	53	138	32	-71	100
8319	METAL MACHINING NEC	292	152	936	1380	293	127	1800
8330	FOREMAN METAL SHAPING	588	326	-172	741	176	-81	835
8331	FORGING	135	65	-79	121	31	-32	120
8333	SHEET METAL WORKERS	1137	991	-873	1255	296	-251	1300
8334	METAL MACHINE OPERAT	952	676	-319	1309	307	-245	1370
8335	WELDING	3261	1571	-693	4139	831	30	5000
8336	INSP TEST MET SHAPING	71	87	90	247	57	-105	200
8337	BOILERMAKERS	347	51	-67	331	20	14	365
8339	METAL SHAPING NEC	374	159	-119	414	98	-92	420
8350	FOREMEN WOOD MACHIN	5	2	-7	0	0	0	0
8353	WOOD SAWING	10	2	-7	5	2	-2	5
8355	PLAN TURN SHAP WOOD	14	3	2	19	4	-3	20
8359	WOOD MACHINING NEC	0	0	9	9	3	-2	10
8370	FOREMEN CLAY GLASS .	5	1	-1	5	2	-2	5
8371	CUTT SHAP CLAY GLASS	20	8	2	30	11	-1	40
8373	ABRAD POLISH CLAY GLA	5	2	-3	4	1	0	5

8376	INSP TEST CLAY GLASS	8	1	-9	0	0	0	0
8379	CLAY GLASS STONE NEC	15	6	4	25	9	1	35
8390	FOREMEN OTHER MACH	5	2	7	14	4	-3	15
8391	ENGRAVERS	0	0	39	39	10	1	50
8393	FILLING GRIND NEC	432	272	-223	482	116	-198	400
8395	PATTERNMAKERS NEC	65	41	-46	60	13	-8	65
8396	INSP TEST GRADING NEC	0	0	9	9	2	-1	10
8399	OTHERS MACHINING NEC	12	4	-7	9	2	-2	10
	TOTAL	13087	6062	-3961	15188	3102	-1570	16720

assembly workers form a specialized occupational group that is currently very much in demand in sector industries.

We anticipate that over the projection period the Welding and Flame Cutting Occupations (8335) will see employment growth similar to growth in production. This will mean an increase of 760 jobs over the 4,140 recorded at the time of the 1981 census.

Although Sheet Metal Workers (8333), Metalworking Machine Operators, nec (8334) and Metal Shaping and Forming Workers, nec (8339) are present in all subsectors, the great majority of them are employed in the stamped, pressed and coated metal products industries (304) and the wire and wire products industries (305). The large scale of mass production in a number of these industries, particularly for metal cans, architectural products (sheet metal for roofing and siding), stamped metal parts and nails, works in favour of more extensive automation of the assembly lines where these machines are used.

In contrast to the situation among machining workers, the fact that employees in the metal shaping and forming occupations have been concentrated in industries that enjoyed strong growth in the 1970s has meant that they have seen a slight increase in their numbers despite a structural shift that on the whole was very negative. However, they too have lost some of their machine-operating duties and instead been given machine feed and production monitoring tasks as well as greater responsibility for quality control. The result has been a certain downgrading of the qualifications needed for these jobs; and consequently, demand for Labourers (8528) has increased more than demand for Machine Operators.

Since the main changes in this area were implemented between 1971 and 1981, the next few years should see an employment growth rate in these groups that is lower than growth in output. In addition, we anticipate that future labour requirements will generally be for less qualified workers, chiefly in Labouring (8528).

Given the trend to integrate quality control more and more into production operations, workers in Inspecting and Testing Occupations (8336) should see a slight decline in their numbers to 1992.

5.7.3 Other Machining Occupations

In this last category of machining occupations, the Filing, Grinding, Buffing, Cleaning and Polishing Occupations group (8393) is the largest. Closely associated with finishing operations, the tasks performed by these manual workers, who usually have little formal training, may well become automated in most sector industries over the next few years.

We therefore anticipate a decline in employment in this group over the projection period, with the total number of workers falling to around 400 by 1992.

5.8 PRODUCT FABRICATING, ASSEMBLING AND REPAIRING OCCUPATIONS

Although this category of occupations accounted for 10% of the sector total in 1971, its share had risen to 15% by 1981. This swift growth during the 1970s was chiefly due to favourable structural changes within the industry. Indeed, this category of workers was the only one to benefit overall from structural shifts in employment in the sector.

5.8.1 Fabricating and Assembling Occupations: Metal Products

The structural increase in employment in the Labouring (8528) and Other Fabricating and Assembling Occupations (8529) groups accounts alone for the greater number of jobs recorded in these occupations.

Besides benefiting from a widening gap between machine operation and production monitoring tasks, workers in labouring jobs have also profited, like other employees in assembling occupations, from the general increase in assembling activity in the sector. Industry officials in the ornamental and architectural metal products (303), wire products (305), heating equipment (307) and other metal fabricating (309) subsectors all reported accelerated growth in their volume of assembling work. Furthermore, since these operations are very difficult to automate and can be performed by workers with few skills, labour supply can react quickly to keep up with fluctuations in production.

Since the volume of assembling activity should continue to grow at a faster rate than overall sector output, these occupational groups should continue to enjoy swifter growth than production to 1992.

5.8.2 Mechanics and Repairers

The two chief occupational groups in this category are Industrial, Farm and Construction Machinery Mechanics and Repairers (8584) and Mechanics and Repairers, Except Electrical, nec (8589). During the period from 1972 to 1981, employment in these two groups grew at approximately the same rate as sector output.

The sophistication of production equipment and the costs of replacement and underutilization have contributed to an increase in preventive maintenance. In addition, the duties of these workers have tended to expand to take in machinery adjustment and regulation.

These same trends should continue over our projection period, so that demand in these occupational groups should increase at more or less the same rate as growth in production. In future, employers will be looking more and more for mechanics who have a basic knowledge of electronics and hydraulics.

TABLE 5.7

RECENT AND PROJECTED EMPLOYMENT TRENDS BY OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR
1971-1992

FABRICATING, ASSEMBLING AND REPAIRING OCCUPATIONS

CCDO	OCCUPATION	RECENT TREND				PROJECTION		
		JOBS 1971	VARIATION 1971-81 CYCL.	VARIATION 1971-81 STRUC.	JOBS 1981	VARIATION 1981-92 CYCL.	VARIATION 1981-92 STRUC.	JOBS 1992
8510	FOREMEN MET PROD NEC	151	50	157	358	87	26	470
8511	ENGINE FAB ASS NEC	4	-1	40	43	2	-0	45
8513	MOTOR VEH FAB ASS NEC	52	3	-28	27	6	-3	30
8515	AIRCRAFT FAB ASS NEC	5	7	-5	8	2	0	10
8523	INDUST FAB ASS NEC	21	4	24	50	9	71	130
8525	BUSI MACH FAB ASS NEC	5	7	-9	4	1	0	5
8526	INSP TEST FAB ASS NEC	157	63	-44	176	41	-42	175
8527	PREC INST FAB ASS NEC	0	0	3	3	0	2	5
8528	LABOURING FAB ASS NEC	107	40	529	675	167	58	900
8529	OTHER FAB ASS NEC	655	360	356	1370	341	89	1800
8530	FOREMEN FAB ASS ELECT	36	7	-18	26	4	0	30
8531	ELECTRICAL FAB ASS	104	-2	-28	74	11	-0	85
8533	ELECTRI INST REP NEC	131	46	-50	127	19	4	150
8534	ELECTRONIC FAB ASS	15	4	-14	5	0	-0	5
8535	ELECTRO INST REP NEC	0	0	14	14	3	-1	15
8536	INSP TEST ELECTR	5	7	-2	10	1	-2	10
8538	LABOURING ELECTR	0	0	24	24	3	-2	25
8539	OTHER ELECTR NEC	54	22	-57	18	4	-2	20
8540	FOREMEN FAB ASS WOOD	0	0	5	5	2	-2	5
8541	WOOD FURNITURE MAKERS	55	32	62	149	51	-0	200
8546	INSP TEST WOOD PROD	5	7	-12	0	0	0	0

8548	LABOURING WOOD PROD	17	7	-3	21	6	-2	25
8549	FAB ASS WOOD PROD NEC	22	17	-29	10	2	-2	10
8551	PATTERN TEXT FUR LEAT	20	6	-26	0	0	0	0
8553	TAILORS DRESSMAKERS	29	9	-38	0	0	0	0
8561	SHOEMAKING REPAIR	5	1	-6	0	0	0	0
8562	UPHOLSTERERS	20	6	-5	21	4	0	25
8563	SEWING MACH OPERATORS	32	10	-29	14	3	-2	15
8569	TEXTILE FUR LEATH NEC	27	9	-32	4	1	-1	5
8571	BOND CEMENT RUB PLAST	0	0	4	4	1	0	5
8573	MOULDING RUBBER PLAST	10	2	21	33	9	-2	40
8575	CUTTING RUBBER PLAST	0	0	5	5	1	-2	5
8576	INSP TEST RUBBER PLAS	0	0	19	19	6	0	25
8578	LABOURING RUBBER PLAS	8	1	-9	0	0	0	0
8579	FAB RUBBER PLAST NEC	10	2	-7	5	1	-1	5
8580	FOREMEN MECHANICS	94	3	-6	90	9	16	115
8581	MOTOR VEHICLE MECHA	338	32	-157	213	13	-6	220
8582	AIRCRAFT MECHANICS	8	-1	-4	3	0	2	5
8583	RAIL TRANSP MECHANICS	8	3	3	13	2	-0	15
8584	INDUSTRIAL MECHANICS	613	243	-37	819	147	-15	950
8585	BUSINESS MACH MECHAN	41	13	-44	10	2	-3	10
8586	INSP TEST EQUIP REP	16	0	-11	5	1	-2	5
8587	WATCH CLOCK REPAIRMEN	4	-1	4	8	2	0	10
8588	PRECI INSTR MECHANICS	5	7	-12	0	0	0	0
8589	MECHANICS REPAIR NEC	129	35	62	227	63	60	350
8590	FOREMEN FAB ASS NEC	44	20	-35	30	8	-3	35
8591	JEWELL SILVER FAB ASS	5	7	-1	12	2	1	15
8592	MARINE CRAFT FAB ASS	11	4	22	37	7	1	45
8593	PAPER PROD FAB ASS	15	22	-17	21	4	0	25
8595	DECORATING PAINTING	166	115	-15	266	66	-2	330
8596	INSP TEST FAB ASS NEC	6	-3	20	24	6	-5	25
8598	LABOURING FAB ASS NEC	76	12	-75	13	4	-2	15
8599	OTHER FAB ASS NEC	140	78	59	277	66	2	345
	TOTAL	3481	1322	568	5371	1190	229	6790

5.8.3 Other Product Fabricating, Assembling and Repairing Occupations

The respondents to our industry questionnaire made very few remarks about these occupational groups. However, the employment trend among painters (8595) points to the fact that very little has been done to automate painting processes. The potential in this area is greatly influenced by the nature of the product and differs throughout the sector. Nevertheless, although paint robots could be used for many tasks, employers are holding off investing in this technology.

Over the projection period we do not anticipate any large-scale introduction of new technology in this area, which remains a relatively minor activity within the sector as a whole. Although based on insufficient information, our forecast is that employment in these occupations will follow approximately the same course as the overall sector.

5.9 OTHER OCCUPATIONAL GROUPS

Of the other occupational groups, the Guards and Related Security Occupations group (6115) suffered a structural drop in employment owing to the increasing use of firms specialized in providing this type of service. The same trend should hold true over the projection period, and the number of jobs in this group should continue to decline to 1992.

Employment growth in the Janitors group (6191) kept pace with growth in sector output between 1972 and 1981. Since this occupational group is generally little affected by technological or organizational development, we forecast that over the projection period it will follow the same trend as during the 1970s.

The various Construction Trades Occupations (87) should on the whole see slower growth than sector output. These occupational groups are chiefly engaged in installing work in the structural metal products and architectural metal products industries (doors, windows, siding). While some of this work is performed by sector firms themselves, a significant share is contracted out to companies in the construction sector. With the exception of the structural metal products industries, we expect that much of the increased activity in this type of work will benefit construction companies.

Like the Guards and Related Security Occupations group, Truck Drivers (9175) have been affected by the trend to contract work out to specialized firms. While this occupational group experienced slow growth between 1971 and 1981, we anticipate that it will suffer a net loss of jobs over the projection period.

Packaging operations figure among those that are the most likely to undergo extensive technological changes throughout the sector during the projection period. We therefore expect that workers in

Packaging Occupations, nec (9317) will see a sharp drop in employment as a result of greater automation. Despite these changes, it appears that the skills these workers will need for running packaging machinery will still be very minimal.

Considerable improvements have been made in handling operations in sector industries over the last few years, and this has resulted in a noticeable drop in demand for workers in Hoisting Occupations, nec (9311). In particular, jobs were lost among Electric Gantry Crane Operator (9311-110) and Overhead Crane Operators (9311-162) because of the introduction of continuous manufacturing processes in the wire products (305) and hardware (306) industries. Improvements in structural steel assembly equipment and techniques have substantially reduced demand for Mobile Crane Operator (9311-130) on building sites.

Material Handling Equipment Operators, nec (9315) have been less affected by technological and organizational developments, and their numbers have grown more rapidly than sector output.

No major changes are expected to affect these two groups over the projection period. Certain investments in continuous manufacturing processes could slow down the rate of employment growth somewhat in the Hoisting Occupations, nec (9311) in relation to overall output growth in the sector. For Material Handling and Related Occupations, nec (9315), we anticipate growth comparable to that in sector production.

Stationary Engine Operating Occupations (9539), which enjoyed moderate growth from 1972 to 1981, should see their numbers fall to 1992. An increasing part of the monitoring activities performed by these workers can now be done by electronic equipment. However, repair and maintenance tasks as well as decisions about machinery adjustment still fall within the realm of human responsibility. While electronically controlled equipment allows greater centralization and reduced labour requirements, there is a tendency for more demands to be made on these workers. Thus, knowledge of electronics and numerically controlled technology will soon become basic requirements for workers in these occupations.

5.10 SECTOR AS A WHOLE

On the basis of our analysis of employment trends in the various occupations, we estimate that by the end of the projection period the employment level in the sector will have reached approximately 40,800. This is an increase of 2,800 jobs over the level recorded in 1981 and an increase of 5,800 over the 1986 level. These figures for employment growth would indicate an overall average rise in labour productivity of 1.1% annually for the period from 1982 to 1992.

As during the period from 1972 to 1982, it is workers in the fabricating, assembling and repairing occupations who should enjoy the strongest growth in employment. In spite of the technological changes

TABLE 5.8

RECENT AND PROJECTED EMPLOYMENT TRENDS BY OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR
1971-1992

OTHER OCCUPATIONS

CCDO	OCCUPATION	RECENT TREND				PROJECTION		
		JOBS 1971	VARIATION 1971-81 CYCL.	VARIATION 1971-81 STRUC.	JOBS 1981	VARIATION 1981-92 CYCL.	VARIATION 1981-92 STRUC.	JOBS 1992
6113	POLICEMEN PRIVATE	8	1	-9	0	0	0	0
6115	GUARDS WATCHMEN	89	48	-71	67	17	-58	25
6119	PROTECTIVE SERV NEC	5	7	-12	0	0	0	0
6120	SUPERV FOOD BEVERAGE	5	7	-12	0	0	0	0
6121	CHEFS ET COOKS	18	17	-25	10	1	-6	5
6125	WAITERS HOSTESSES	0	0	13	13	3	-1	15
6162	LAUNDERIES DRY CLEAN	4	-1	-4	0	0	0	0
6190	SUPERV OTHER SERVICE	10	15	-20	5	1	-2	5
6191	JANITORS	184	97	-17	264	50	-14	300
6198	LABOURING SERV	23	-4	-19	0	0	0	0
7195	NURSERY WORKERS	5	2	12	19	4	-3	20
7513	TIMBER CUTTING	0	0	4	4	1	-1	5
7518	LABOURING FOREST LOGG	5	1	-6	0	0	0	0
7519	FORESTRY LOGGING NEC	4	-1	-4	0	0	0	0
7710	FOREMEN MINING QUARR	8	1	-4	5	1	-1	5
7717	MINING QUARRING	0	0	5	5	1	-1	5
7719	MINING QUARRYING NEC	8	1	-9	0	0	0	0
8710	FOREMEN EXCAV GRADING	26	14	-40	0	0	0	0
8711	EXCAVATING GRADING	49	24	-63	10	3	-3	10
8715	RAIL SECT TRACKMEN	8	3	-10	0	0	0	0
8718	LABOURING EXCAV GRAD	5	7	-7	5	-0	0	5

8730	FOREMEN ELECTR POWER	11	5	9	25	6	-6	25
8731	ELECTR POWER LINEMEN	7	4	-6	5	0	-0	5
8733	CONSTR ELECTRICIANS	106	46	-93	59	10	0	70
8735	WIRER COMMU INSTALL	4	-1	-4	0	0	0	0
8736	INSP TEST ELECTRICAL	8	1	-4	5	1	-2	5
8738	LABOURING ELECTRICAL	7	4	-9	3	0	-3	0
8780	FOREMEN OTHER CONTRUC	133	64	-24	173	39	-22	190
8781	CARPENTERS	122	58	-46	134	37	-46	125
8782	BRICK STONE MASONS	24	4	-3	24	4	2	30
8783	CONCRETE FINISHING	0	0	16	16	4	1	20
8784	PLASTERERS	15	22	-28	10	4	-4	10
8785	PAINTERS PAPERHANGERS	138	117	-99	157	37	-24	170
8786	INSULATING OCC CONSTR	0	0	10	10	2	-2	10
8787	ROOFING WATERPROOFING	5	7	-12	0	0	0	0
8791	PIPEFITTING PLUMBING	131	55	-62	125	21	-6	140
8793	STRUCT METAL ERECTORS	404	239	-145	498	107	-24	580
8795	GLAZIERS	65	31	-15	80	29	-19	90
8796	INSP TEST CONSTRUC	21	13	18	52	12	-4	60
8798	LABOURING CONSTRUC	99	55	-43	111	33	-19	125
8799	CONSTRUCTION NEC	139	61	2	201	54	-21	235
9171	BUS DRIVERS	0	0	11	11	3	-3	10
9173	TAXI DRIVERS CHAUFF	10	15	-20	5	1	-1	5
9175	TRUCK DRIVERS	467	261	-217	511	121	-202	430
9310	FOREMEN HANDLING NEC	21	14	-17	18	4	-8	15
9311	HOISTING OCC NEC	280	176	-214	242	48	-30	260
9313	LONGSHOREMEN	61	37	-33	65	16	-7	75
9315	MAT HAND EQUIP OP NEC	82	38	62	183	45	2	230
9317	PACKAGING OCC NEC	418	251	-188	481	117	-248	350
9318	LABOUR ELEMENT WORK	12	3	26	40	9	0	50
9319	MATERIALS HANDL NEC	0	0	17	17	5	-2	20
9510	FOREMEN PRINTING	25	4	-29	0	0	0	0
9511	TYPESETTERS	0	0	8	8	1	1	10
9512	PRINT PRESS OCC	5	7	29	42	10	-6	45
9513	STEREO ELECTRO TYPERS	0	0	4	4	1	-1	5

TABLE 5.8 (cont'd)

RECENT AND PROJECTED EMPLOYMENT TRENDS BY OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR
1971-1992

OTHER OCCUPATIONS

CCDO	OCCUPATION	RECENT TREND			PROJECTION			
		JOBS 1971	VARIATION 1971-81 CYCL.	VARIATION 1971-81 STRUC.	JOBS 1981	VARIATION 1981-92 CYCL.	VARIATION 1981-92 STRUC.	JOBS 1992
9514	PRINTING ENGRAVERS	15	22	2	40	10	-5	45
9515	PHOTOENGRAVERS	7	4	-11	0	0	0	0
9518	LABOURING PRINT NEC	15	22	-23	15	4	-3	15
9519	PRINTING OCC NEC	24	6	-26	4	1	0	5
9530	FOREMEN STATION ENG	20	-4	16	32	6	-3	35
9531	POWER STATION OPER	8	1	-9	0	0	0	0
9539	STATION ENGINE NEC	219	77	-43	253	53	-96	210
9590	FOREMEN OTH CRAFT NEC	20	2	-22	0	0	0	0
9910	SUPERVI FOREMEN NEC	181	96	-262	15	4	-3	15
9916	INSPEC TESTING NEC	187	94	-275	5	-0	0	5
9918	LABOURING NEC	1495	853	-2136	211	48	-25	235
	TOTAL	5470	3012	-4182	4299	989	-928	4360

that will affect production equipment, the machining occupations should also see swifter growth than the average for sector employment.

While we anticipate that employment levels in the management and sales occupations should remain steady, we expect that the downward trend in the clerical occupations should continue, resulting in a drop of approximately 6% in the number of jobs in this category.

TABLE 5.9
EMPLOYMENT TRENDS BY MAJOR OCCUPATIONAL GROUP
QUEBEC FABRICATED METAL PRODUCTS SECTOR

CCDO	OCCUPATION GROUP	RECENT TREND				PROJECTION		
		Jobs 1971	VARIATION 1972-1981 Cycl.	Struc.	Jobs 1981	VARIATION 1982-92 Cycl.	Struc.	Jobs 1992
11	Managerial and professional	2,060	840	-300	2,600	590	-555	2,635
21-37	Technical support	1,775	685	-1,009	1,455	304	-207	1,550
41	Clerical	4,660	2,009	-2,274	4,395	1,009	-1,249	4,155
51	Sales	1,710	755	-1,208	1,255	294	-260	1,290
81-82	Processing	2,015	1,062	-313	2,765	635	-505	2,895
83	Machining	13,085	6,062	-3,961	15,190	3,102	-1,570	16,720
85	Fabricating, assembling and repairing	3,480	1,322	568	5,370	1,190	229	6,790
85	Other	6,405	3,444	-4,882	4,970	1,421	-1,628	4,765
	TOTAL	35,190	16,180	-13,381	38,000	8,545	-5,745	40,800

SUMMARY

The fabricated metal products sector is characterized by very diversified output that is chiefly oriented toward meeting the requirements of the domestic market. Quebec production, like that in Canada as a whole, is very dependent on cyclical trends in manufacturing and construction its main markets.

Output levels dropped sharply during the 1981-1982 recession, with Canadian purchases of fabricated metal products falling by more than 30% between 1980 and 1983. The early recovery of the Quebec construction industry stimulated the recovery of sector production in 1984. By the end of 1985, however, output levels were still 15% below the record level they reached in 1980.

Faced with this tough economic situation, sector firms had to cut no less than 9,000 workers from their payrolls between 1980 and 1983, ie over 20% of the industry work force. Just as sector shipments will return to their prerecession level only very gradually over the course of the projection period, employment in the industry will see only a very slight rise between 1981 and 1992. From the 1986 level of 35,000 jobs, another 5,800 should be added by the end of our forecasting period.

As during the period from 1971 to 1981, certain technological, technical and organizational changes should continue to have an impact on employment in the various occupational groups from 1981 to 1992.

One major change is the progress in office automation, which will continue to cause job losses in the clerical occupations besides significantly altering the nature of the tasks to be performed by these employees. The non-specialized clerk groups will again be the most vulnerable to this new technology, while more skilled workers will have to adapt to substantial changes in their duties.

Computer-aided design and manufacturing (CAD/CAM) technology will be introduced on a much smaller scale than numerical control technology. The main developments in production equipment will focus chiefly on the addition of numerical control units to existing equipment and the improvement of organic links between machines. Besides reducing the need for machine operators, these improvements tend to dissociate the tasks of equipment adjustment and operation from those of feeding and monitoring production equipment.

Workers in the assembling occupations, whose tasks are difficult to automate because of the nature of the products to be assembled, are the only ones who should benefit from structural growth in employment. This is the expected consequence of an increase in the volume of assembling work in certain sector industries.

Finally, the use of independent firms for work in the areas of transportation, maintenance and building security as well as for consulting services in auditing, engineering, management, data processing and other fields should have a major impact on employment trends in certain occupational groups.